

## ... CLAIMS

1. An apparatus for identifying a liquid type of a gasoline, comprising:

a gasoline liquid type identifying chamber for causing

5 an identified gasoline introduced into a liquid type identifying apparatus body to stay temporarily;

a liquid type identifying sensor heater provided in the gasoline liquid type identifying chamber; and

10 a liquid temperature sensor provided in the gasoline liquid type identifying chamber apart from the liquid type identifying sensor heater at a constant interval;

the liquid type identifying sensor heater including a heater and an identifying liquid temperature sensor provided in the vicinity of the heater,

15 the apparatus further comprising an identification control portion for applying a pulse voltage to the liquid type identifying sensor heater for a predetermined time, heating the identified gasoline staying temporarily in the gasoline liquid type identifying chamber by the heater and identifying the liquid

20 type with a voltage output difference  $V_0$  corresponding to a temperature difference between an initial temperature and a peak temperature in the identifying liquid temperature sensor, and

an alcohol content detecting chamber,

the alcohol content detecting chamber being provided with

an alcohol concentration detecting device in which an alcohol concentration in the gasoline is detected by introducing a gasoline between electrodes of an alcohol concentration detecting sensor, and by measuring a change in a specific 5 inductive capacity of the gasoline between the electrodes with an oscillation frequency, and

based on the alcohol concentration detected by the alcohol concentration detecting device, liquid type identification data in the identification control portion being corrected on the 10 basis of alcohol concentration data which are prestored in the identification control portion, thereby identifying a liquid type.

2. The apparatus for identifying a liquid type of a gasoline 15 according to claim 1, wherein the voltage output difference  $V_0$  is equal to a voltage difference between an average initial voltage  $V_1$  obtained by sampling an initial voltage before application of the pulse voltage at a predetermined number of times and an average peak voltage  $V_2$  obtained by sampling a peak 20 voltage after the application of the pulse voltage at a predetermined number of times, that is,

$$V_0 = V_2 - V_1.$$

3. The apparatus for identifying a liquid type of a gasoline

according to claim 1 or 2, wherein in accordance with calibration curve data to be a correlation of a voltage output difference with a temperature for a predetermined reference gasoline prestored in the identification control portion, the 5 identification control portion is constituted to identify a type of a gasoline with the voltage output difference  $V_0$  obtained for the identified gasoline.

4. The apparatus for identifying a liquid type of a gasoline 10 according to any of claims 1 to 3, wherein the identification control portion is constituted to correlate a liquid type voltage output  $V_{out}$  for the voltage output difference  $V_0$  at a measuring temperature of the identified gasoline with an output voltage for a voltage output difference at a measuring temperature for 15 a predetermined threshold reference gasoline and to thus carry out a correction.

5. The apparatus for identifying a liquid type of a gasoline according to any of claims 1 to 4, wherein the liquid type 20 identifying sensor heater is a laminated liquid type identifying sensor heater in which a heater and an identifying liquid temperature sensor are laminated through an insulating layer.

6. The apparatus for identifying a liquid type of a gasoline

according to any of claims 1 to 5, wherein the heater and the identifying liquid temperature sensor in the liquid type identifying sensor heater are constituted to come in contact with the identified gasoline through a metallic fin,  
5 respectively.

7... The apparatus for identifying a liquid type of a gasoline according to any of claims 1 to 6, wherein the liquid temperature sensor is constituted to come in contact with the identified  
10 gasoline through the metallic fin.

8. The apparatus for identifying a liquid type of a gasoline according to any of claims 1 to 7, wherein the alcohol concentration detecting sensor comprises an alcohol  
15 concentration detecting sensor body including a base material resin film, an electrode wiring pattern formed on the base material resin film, and an insulating resin covering a surface of the electrode wiring pattern.

20 9. The apparatus for identifying a liquid type of a gasoline according to claim 8, wherein the alcohol concentration detecting sensor body is stuck onto a substrate.

10. The apparatus for identifying a liquid type of a gasoline

according to claim 8 or 9, wherein the electrode wiring pattern is obtained by selectively etching a conductive metallic foil laminated on one of surfaces of the base material resin film, thereby forming a wiring pattern taking a predetermines shape.

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11. The apparatus for identifying a liquid type of a gasoline according to any of claims 1 to 7, wherein the alcohol concentration detecting sensor comprises a substrate, an electrode wiring pattern formed on the substrate, and an insulating coat covering a surface of the electrode wiring pattern.

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12. The apparatus for identifying a liquid type of a gasoline according to claim 11, wherein the electrode wiring pattern is obtained by selectively etching a conductive metallic thin film formed on one of surfaces of the substrate by sputtering, thereby forming a wiring pattern taking a predetermines shape.

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13. The apparatus for identifying a liquid type of a gasoline according to claim 11 or 12, wherein the insulating coat is formed by chemical vapor deposition (CVD).

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14. The apparatus for identifying a liquid type of a gasoline according to any of claims 8 to 13, wherein the electrode wiring

pattern has such a shape that positive and negative electrodes which are comb-toothed are alternately intricate.

15. A method for identifying a liquid type of a gasoline,  
5 comprising the steps of:

applying a pulse voltage for a predetermined time to a liquid type identifying sensor heater including a heater and an identifying liquid temperature sensor provided in the vicinity of the heater; heating an identified gasoline by the heater;  
10 and identifying the liquid type with a voltage output difference,

V<sub>0</sub> corresponding to a temperature difference between an initial temperature and a peak temperature in the identifying liquid temperature sensor;

introducing a gasoline between electrodes of an alcohol  
15 concentration detecting sensor, and measuring a change in a specific inductive capacity of the gasoline between the electrodes with an oscillation frequency thereby detecting an alcohol concentration in the gasoline; and

wherein based on the alcohol concentration detected by  
20 the alcohol concentration detecting device, correcting liquid type identification data in the identification control portion on the basis of alcohol concentration data which are prestored in the identification control portion, thereby identifying a liquid type.

16. The method for identifying a liquid type of a gasoline according to claim 15, wherein the voltage output difference V0 is equal to a voltage difference between an average initial 5 voltage V1 obtained by sampling an initial voltage before application of the pulse voltage at a predetermined number of times and an average peak voltage V2 obtained by sampling a peak voltage after the application of the pulse voltage at a predetermined number of times, that is,

10            $V_0 = V_2 - V_1.$

17. The method for identifying a liquid type of a gasoline according to claim 15 or 16, wherein in accordance with calibration curve data to be a correlation of a voltage output 15 difference with a temperature for a predetermined reference gasoline which is prestored, a type of a gasoline is identified with the voltage output difference V0 obtained for the identified gasoline.

20 18. The method for identifying a liquid type of a gasoline according to any of claims 15 to 17, wherein a liquid type voltage output  $V_{out}$  for the voltage output difference V0 at a measuring temperature of the identified gasoline is correlated with an output voltage for a voltage output difference at a measuring

temperature for a predetermined threshold reference gasoline  
and is thus corrected.

19. The method for identifying a liquid type of a gasoline  
5 according to any of claims 15 to 18, wherein the liquid type  
identifying sensor heater is a laminated liquid type identifying  
sensor heater in which a heater and an identifying liquid  
temperature sensor are laminated through an insulating layer.
- 10 20. The method for identifying a liquid type of a gasoline  
according to any of claims 15 to 19, wherein the heater and the  
identifying liquid temperature sensor in the liquid type  
identifying sensor heater are constituted to come in contact  
with the identified gasoline through a metallic fin,  
15 respectively.
21. The method for identifying a liquid type of a gasoline  
according to any of claims 15 to 20, wherein the liquid temperature  
sensor is constituted to come in contact with the identified  
gasoline through the metallic fin.

22. The method for identifying a liquid type of a gasoline  
according to any of claims 15 to 21, wherein the alcohol  
concentration detecting sensor comprises an alcohol

concentration detecting sensor body including a base material resin film, an electrode wiring pattern formed on the base material resin film, and an insulating resin covering a surface of the electrode wiring pattern.

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23. The method for identifying a liquid type of a gasoline according to claim 22, wherein the alcohol concentration detecting sensor body is stuck onto a substrate.

10 24. The method for identifying a liquid type of a gasoline according to claim 22 or 23, wherein the electrode wiring pattern is obtained by selectively etching a conductive metallic foil laminated on one of surfaces of the base material resin film, thereby forming a wiring pattern taking a predetermines shape.

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25. The method for identifying a liquid type of a gasoline according to any of claims 15 to 21, wherein the alcohol concentration detecting sensor comprises a substrate, an electrode wiring pattern formed on the substrate, and an insulating coat covering a surface of the electrode wiring pattern.

20 26. The method for identifying a liquid type of a gasoline according to claim 25, wherein the electrode wiring pattern is

obtained by selectively etching a conductive metallic thin film formed on one of surfaces of the substrate by sputtering, thereby forming a wiring pattern taking a predetermines shape.

5 27. The method for identifying a liquid type of a gasoline according to claim 25 or 26, wherein the insulating coat is formed by chemical vapor deposition (CVD).

10 28. The method for identifying a liquid type of a gasoline according to any of claims 22 to 27, wherein the electrode wiring pattern has such a shape that positive and negative electrodes which are comb-toothed are alternately intricate.

15 29. An apparatus for identifying a liquid type of a gasoline of a car,

wherein the apparatus for identifying a liquid type of a gasoline according to any of claims 1 to 14 is provided in a gasoline tank or on an upstream side or a downstream side of a gasoline pump.

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30. A method for identifying a liquid type of a gasoline of a car, comprising the step of:

identifying a type of a gasoline in a gasoline tank or on an upstream side or a downstream side of a gasoline pump by

using the method for identifying a liquid type of a gasoline according to any of claims 15 to 28.

31. An apparatus for reducing an exhaust gas of a car,  
5 comprising:

the apparatus for identifying a liquid type of a gasoline according to any of claims 1 to 14 which is provided in a gasoline tank or on an upstream side or a downstream side of a gasoline pump; and

10 an ignition timing control device for regulating an ignition timing based on the type of the gasoline which is identified by the apparatus for identifying a liquid type of a gasoline.

15 32. A method for reducing an exhaust gas of a car, comprising the steps of:

identifying a type of a gasoline in a gasoline tank or on an upstream side or a downstream side of a gasoline pump by using the method for identifying a liquid type of a gasoline  
20 according to any of claims 15 to 28; and

regulating an ignition timing based on the type of the gasoline which is identified by the apparatus for identifying a liquid type of a gasoline.

33. An apparatus for reducing an exhaust gas of a car, comprising:

the apparatus for identifying a liquid type of a gasoline according to any of claims 1 to 14 which is provided in a gasoline tank or on an upstream side or a downstream side of a gasoline pump; and

a gasoline compression control device for regulating a compressibility of the gasoline based on the type of the gasoline which is identified by the apparatus for identifying a liquid type of a gasoline.

34. A method for reducing an exhaust gas of a car, comprising the steps of:

identifying a type of a gasoline in a gasoline tank or on an upstream side or a downstream side of a gasoline pump by using the method for identifying a liquid type of a gasoline according to any of claims 15 to 28; and

regulating a compressibility of the gasoline based on the type of the gasoline which is identified by the apparatus for identifying a liquid type of a gasoline.